

## CLAIMS

1. A multiple-mode dielectric resonator comprising a dielectric core that is disposed in a conductive cavity so as to be separated by a predetermined distance from a surface of at least one inside wall defining the cavity, wherein a through hole is formed in the dielectric core and at least one support bar is inserted into the through hole and is secured to the cavity, so that the dielectric core is supported in the cavity.

2. The multiple-mode dielectric resonator according to Claim 1, wherein said at least one support bar is conductive, and both ends of said at least one support bar are electrically connected to opposing inside walls of said at least one inside wall defining the cavity, so that a short circuit is produced between the inside walls.

3. The multiple-mode dielectric resonator according to Claim 2, wherein an insulating bushing is disposed between an inside wall defining the through hole and said at least one support bar.

4. The multiple-mode dielectric resonator according to Claim 3, wherein the bushing is formed of a material whose

dielectric constant is lower than that of the dielectric core.

5. The multiple-mode dielectric resonator according to any one of Claims 1 to 4, wherein the cavity has a rectangular parallelepiped form, said at least one support bar comprises two or three support bars, and both ends of each support bar are joined to different pairs of opposing inside walls of said at least one inside wall defining the cavity.

6. The multiple-mode dielectric resonator according to any one of Claims 1 to 5, wherein the dielectric core has a substantially rectangular parallelepiped form.

7. The multiple-mode dielectric resonator according to any one of Claims 1 to 6, wherein at least a portion of said at least one support bar is formed of a dielectric material whose dielectric constant is lower than that of the dielectric core.

8. The multiple-mode dielectric resonator according to any one of Claims 1 to 7, wherein said at least one support bar has a hollow and is formed of a material whose dielectric constant is lower than that of the dielectric

core, and a conductor is disposed in the hollow.

9. The multiple-mode dielectric resonator according to any one of Claims 1 to 8, wherein the through hole and said at least one support bar each have a polygonal form in cross section.

10. The multiple-mode dielectric resonator according to any one of Claims 1 to 9, which is a TE triplex mode resonator in which excitation occurs at three TE<sub>01</sub> delta modes in which electric field vectors, respectively, pass around three axes, an X axis, a Y axis, and a Z axis, where the X, Y, and Z axes are coordinate axes that are orthogonal to each other.

11. A dielectric filter comprising:  
the multiple-mode dielectric resonator of any one of Claims 1 to 10; and  
external coupling means for externally coupling to a predetermined mode of the multiple-mode dielectric resonator.

12. A communication device, wherein the multiple-mode dielectric resonator of any one of Claims 1 to 10 or the dielectric filter of Claim 11 is provided at a high-frequency circuit.